NASA Ames Research Center

Task Order - 39

CTAS Direct-To

Computer-Human Interface (CHI) Specification for D2 at the R-Position

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1. Scope

This document specifies the CTAS Direct-To Computer-Human Interface (CHI) design for the Display System (DS) R-position.

The R-position Direct-To CHI was designed to be consistent with currently fielded DS capabilities and conventions (DS release BBC20 – Flight Plan Readout View, Continuous Range readout function) as well as consistent with capabilities and conventions that have been engineered and are being introduced in the next three years into the DS R-position. These capabilities that are scheduled to be fielded in the next three years include textual and graphic annotations (fall/2001- currently being developed), 4th line of the FDB capabilities (fall/2002 - currently being developed), interactive data block capabilities (fall/2002 - CHI design complete and B spec - requirements being written) and data link capabilities including line 0 of the FDB (fall/2003 - CHI design complete and B-spec requirements being written).

2. Direct-To View

The Direct-To tool is initiated at a workstation by the controller command, "D2 on". This brings up the populated Direct-To View and starts the 6-second updates from Direct-To. Direct-To is turned off at the workstation by the controller command, "D2 off", which causes the window to be removed and the flow of data from D2 to stop.

The DS Direct-To View consists of a view header and a view body.

2.1 View Header

The view header contains:

1. a toggle button to set the view to opaque or semi transparent. The button is labeled "O" when the view is set to opaque and "T" when the view is set to semi-transparent. The view header is gray-shaded when the view is set to opaque and has a black background when the view is set to semi-transparent.
2. an indication of the number of aircraft in the view (e.g., "12 AC")
3. a view title (DIRECT-TO)
4. a DELETE button to delete a user selected entry from the Direct-To View
5. an increment/decrement button (FONT d) that controls the size (2-5) of the list entry font
6. a view suppression button ("-"). The view can be re-displayed by clicking on the Direct-To button of the R-position toolbar. When the view is displayed, the toolbar Direct-To button is grayed out.

2.2 View Body

The view body contains a Direct-To List Display Area. The view expands/contracts to accommodate the number of aircraft entries.

The Direct-To List Display Area contains:

1. Direct-To data from left to right:
   - A red or yellow digit indicating time to conflict, if current route of flight is in conflict
   - Aircraft id/equipment/destination field
   - Direct-To fix/heading field
   - Minutes saved field
   - Host Preferential Route indicator "+"
   - Status field containing the conflict status of the Direct To route (green "OK" or red digit indicating time to conflict or yellow digit indicating time to conflict)
   - Left justified AID and Fix /Heading data within columns as is done in other DS windows. Right justified minutes saved and status data.

2.2.1 Direct-To View Posting Rules

Flights will be added to the DS Direct-To View when the flight's predicted savings is at least 1.0 minutes **and** one of the following is true:

1. the flight is in handoff to the sector **or**
2. the flight is controlled by the sector **or**
3. the flight has been handed off to the next sector but the handoff has not been accepted.

2.2.2 Direct-To View Deletion Rules

Flights will be deleted from the DS Direct-To View when:

-the predicted timesavings for all possible direct-to routes are less then 1.0 minutes
-the handoff has been accepted for the flight by the next sector
-the flight plan has been dropped from the Host system
-the flight entry is manually deleted by the controller
- when a controller sends a message to the Host to amend the flight plan route and Host accepts the amendment.

If the controller chooses to send a flight direct to a fix that is not the one with greatest time savings, the entry for that flight will still remain in the list if the difference between the fix selected by the controller and any other downstream fix is greater than 1.0 min. An accepted altitude amendment does not affect the Direct-To aircraft entries.

2.2.3 Direct-To View Sort Order

Flights in order of minutes saved with greatest savings are displayed at the top of the list.

2.2.4 Direct-To View – View Manipulation Functions:

1. The controller can move the view by picking the view title. Picking the view title displays an outline of the view that the controller can position. When the controller closes the move action the view is repositioned.
2. The controller can set the view to opaque or semi-transparent.
3. The controller can delete an entry by selecting the aid/equip/destination field (left button) and selecting DELETE (left or right button)
4. The controller can display the Alternate Fixes/Altitudes View by selecting the aid/equip/destination (right click) field or the fix/heading field (right click).
5. The controller can decrement the font by left clicking the FONT button. The controller can increment the font by right clicking the FONT button.

2.2.5 Direct-To View – Trial Planning Functions

Controller will use the aid/equip/destination field or fix/heading field to activate the Direct-To trial planning function for a flight. Picking either field (right button) for a flight results in the display of the Alternate Fixes/Altitudes View with D2 selected fix and associated probed altitudes.

2.2.6 Direct-To View – Conflict Data Functions

1. The user can pick (left or right button) the current route conflict numeric to readout the conflict data for the closest (time-wise) conflict with the Host flight plan route. The aid and the three numerics associated with the conflict (time, vertical separation, and horizontal separation) are displayed in the Direct-To View replacing the Fix/Heading and the Mins. Saved data for the flight. To remove the conflict data readout, the controller picks the numeric a second time. The display then shows fix/heading and minutes saved data.

2. The user can pick (left or right button) the direct-to route conflict numeric to readout the conflict data for the closest (time-wise) conflict with the direct-to route. The aid and the three numerics associated with the conflict (time, vertical separation, and horizontal separation) are displayed in the Direct-To View replacing the Fix/Heading and the Mins. Saved data for the flight. To remove the conflict data readout, the controller picks the numeric a second time. The display then shows fix/heading and minutes saved data.

3. Alternate Fixes/Altitudes View

The DS Direct-To Alternate Fixes/Altitudes View replaces the Direct-To View when requested by the user. The user can request this presentation either by picking an AID or fix/heading from the Direct-To View, or by picking the Direct-To symbol after the AID field in the FDB. The Direct-To Alternate Fixes/Altitudes View and the Direct-To View share the same viewport location on the display. The view is sized to display all of the fixes available for an aircraft.

The DS Direct-To Alternate Fixes/Altitudes View consists of a view header and a view body.

3.1 View Header

The view header contains:

1. a toggle button to set the view to opaque or semi transparent. The button is labeled "O" when the view is set to opaque and "T" when the view is set to semi-transparent. The view header is gray-shaded when the view is set to opaque and has a black background when the view is set to semi-transparent.
2. a view title (DIRECT-TO ALTERNATE FIXES/ALTITUDES)
3. a RETURN button to return the display to the Direct-To View
4. a view suppression button ("-"). The Direct-To View can be re-displayed by clicking on the Direct-To button of the R-position toolbar. When the view is displayed, the toolbar Direct-To button is grayed out.

3.2 View Body

The Alternate Fixes/Altitudes View body contains:

1. an Alternate Fixes List
2. an Altitude Menu
3. an Amendment Area

The Alternate Fixes List contains:

1. AID/equip/destination field
2. a list of alternate fix/headings prefixed with a "t" if a transition fix and/or a "→" (yellow) if the fix is the CTAS selected fix
3. minutes saved data
4. status of the CTAS selected fix (green OK or red digit or yellow digit)
5. left justified Fix /Heading data within columns as is done in other DS windows; right justified minutes saved data.

The Altitude Menu contains a list of altitude values for user selection, color coded to indicate conflict status (green – no conflicts, red or yellow - in conflict with other aircraft, white – not probed for conflicts). The flight plan assigned altitude is also shown if the FDB is displaying an interim. The probe results for the altitude values are calculated for the selected fix. A max of 15 flight levels may be displayed.

The Amendment Area is located at the bottom of the Alternate Fixes/Altitudes View causing the view to expand/contract to accommodate its display/removal. The Amendment Area contains:

- Status line
- PREF RTE label, if applicable, (cyan text)
- AMEND button (green, red, or yellow text based on status of Direct-To route, background shaded gray when selected)
- CANCEL button or CLOSE FP button. (CANCEL button is displayed with white text if STATUS = TRIAL PLANNING; CANCEL button is displayed in gray text if STATUS = AM SENT TO HOST, CLOSE FP button displayed with white text if STATUS = HOST ACCEPT or HOST REJECT message)
- Direct-To route change (CID, AID, route text)

- Conflict data and AIDs of aircraft conflicting with proposed Direct-To route, if applicable, displayed below the Direct-To trial plan route.

3.2.1 Direct-To Alternate Fixes List – Sort Order

In the DS R-position Direct-To Alternate Fixes List, the fixes are displayed according to distance of fix from current position along the flight plan route with the next closest fix at the top of the list and subsequent fixes on the route of flight displayed after the next fix.

3.2.2 Direct-To Altitude Menu – Sort Order

Altitudes in the Altitude Menu are displayed with the higher altitudes at the top of the menu.

3.2.3 Direct-To Alternate Fixes/Altitudes View – View Manipulation Functions:

1. The controller can move the view by picking the view title. Picking the view title displays an outline of the view that the controller can position. When the controller closes the move action the view is repositioned.
2. The controller can set the view to opaque or semi-transparent.
3. The controller can pick (left or right button) the RETURN button to return the presentation to the Direct-To View.

3.2.4 Direct-To Alternate Fixes/Altitudes View - Trial Planning Functions

1. Activating the Trial Planning function for a flight results in the display of :
   - The flight plan route of flight from Host (yellow) and the direct-to route (yellow-dashed) on the Situation Display.
   - Magnetic heading and fix name in the FDB replacing the D2 portal symbol and minutes to conflict.
   - Amendment Text Area with associated amendment text for direct to route and conflict data and AID from any conflicting flights.
   - Cursor is automatically placed next to but not in the AMEND button to facilitate accepting the amendment with minimal cursor movement
   - Reverse video coding of selected fix/heading field to indicate that flight is being worked.

   Note: the probe results for altitudes will change to reflect the fix selected.
   Note: the current flight plan route of flight for the selected flight will not be displayed in the Amendment Area. The current flight plan route of flight data may be displayed by the controller in the DS Flight Plan Readout View if needed.

2. The controller may send the proposed Direct-To route amendment for the trial plan displayed in the Amendment Area to the Host by picking (left or right button) the AMEND button. Upon Host acceptance of the amendment, the new Host Flight Plan route of flight is displayed in solid yellow for

a period of time after which the route and the Amendment Area are removed and the Direct-To view is redisplayed. If Host rejects the amendment, the Amendment Area remains displayed. The user can close the Amendment Area by picking (left or right button) the CLOSE FP button or choose another fix or altitude to trial plan.

3. The controller may compose an altitude amendment to Host by picking an altitude value from the menu. The altitude amendment text is displayed in the Amendment Area. Cursor is automatically placed next to but not in the AMEND button to facilitate accepting the amendment with minimal cursor movement.

4. The controller may send the altitude amendment for the trial plan displayed in the Amendment Area to the Host by picking (left or right button) the AMEND button. Upon Host acceptance of the amendment, the Amendment Area is removed after a period of time and the Direct-To View is redisplayed. If Host rejects the amendment, the Amendment Area remains displayed with the Alternate Fixes/Altitudes View. The user can close the Amendment Area by picking (left or right button) the CLOSE FP button or choose another fix or altitude to trial plan.

5. The controller may cancel the trial planning action for a flight before the amendment is sent by picking (left or right button) the CANCEL button in the Amendment Area. Once the amendment is sent and before a response is returned from Host the CANCEL button is grayed out and is not available. When trial planning is canceled, the Amendment Area is removed from the Alternate Fixes/Altitudes View and the Alternate Fixes List and Altitude Menu remains displayed.

4. Conflicts View

The Conflicts View (Figure 15) presents information about pairs of aircraft, at least one of which is controlled by the sector position, that are predicted to have flight plan conflicts with each other. Pairs of aircraft are placed on this list whether or not either of them are on the Direct-To View. The Conflicts View is brought up by clicking on the Conflicts button on the R-Position Toolbar.

The Conflicts View contains a view header and a view body.

4.1 View Header

The view header contains:

1. a toggle button to set the view to opaque or semi transparent. The button is labeled “O” when the view is set to opaque and “T” when the view is set to semi-transparent. The view header is gray-shaded when the view is set to opaque and has a black background when the view is set to semi-transparent.
2. a view title (CONFLICTS)
3. a view suppression button (“-“). The Conflicts View can be re-displayed by clicking on the Conflicts button of the R-position toolbar. When the view is displayed, the toolbar Conflicts button is grayed out.

4.2 View Body

The view body contains a list of conflict aircraft pairs. The view expands/contracts to accommodate the number of aircraft pair entries.

The Conflicts View body contains:
1. Column labels (MIN, FL, NM)
2. Conflict data from left to right:
    - AID of first aircraft of pair (coded gray if not under sector control)
    - Gradient symbol for each aircraft (climbing [↑ up arrow], descending [↓ down arrow], level [–])
    - AID of second aircraft of pair
    - Time in minutes to conflict
    - Vertical separation in 100s of feet
    - Horizontal separation in nautical miles

The conflict data (MIN, FL, and NM) is the same data that appears in the Amendment Area when conflicts are predicted with an aircraft selected for trial planning. The probability of the conflict occurring is indicated by the color of the numerals.

Clicking anywhere on an aircraft pair entry will produce the conflict route graphics on the Situation Display. The portion of the route from current location to the start of conflict will be coded red.

4.2.1 Conflicts View Posting Rules

Flight pairs will be added to the DS Direct-To Conflicts View when a conflict has been predicted and at least one of the aircraft is controlled by the sector position.

4.2.2 Conflicts View Deletion Rules

Flights will be deleted from the DS Conflicts View when:
-neither aircraft is controlled by the sector position
-the conflict no longer exists.

4.2.3 Conflicts View Sort Order

The list is generally sorted according to the amount of time in minutes before the first loss of separation is predicted to occur. The aircraft pair with the shortest time to first loss of separation is at the top of the list. Exceptions to this will occur when CTAS D2 determines that sorting should be inhibited.

4.2.4 Conflicts View – View Manipulation Functions:

1. The controller can move the view by picking the view title. Picking the view title displays an outline of the view that the controller can position. When the controller closes the move action the view is repositioned.
2. The controller can set the view to opaque or semi-transparent.

5. Situation Display Functions

5.1 Graphic Route Displays

5.1.1 Direct-To Route Displays

Route lines for the current flight plan and the Direct-To route are displayed when in trial planning mode. These displays contain the following components:

- The DS current flight plan route is displayed as a solid yellow line.
- The Direct-To route is displayed as a dashed yellow line.
- For departure aircraft, the location of the predicted Top of Climb (TOC) is marked on both the flight plan and the trial plan trajectories. In both cases, the location is indicated by the "*" symbol in a circle in the color of the route. Once the aircraft has reached cruising altitude the TOC data will no longer be displayed.
- After an amendment has been sent and accepted by Host, the new flight plan route will be displayed in solid yellow for an adapted period of time following the amendment acceptance from Host.

5.1.2 Flight Plan Conflict Displays

If a numeral appears after the D2 portal in the FDB, indicating minutes to loss of flight plan separation, clicking on the numeral will cause the flight plan conflict segments to be displayed on the Situation Display. Asterisks show the points of initial loss of separation. The portions of the flight plan routes for all aircraft involved in the conflict are displayed in red including the asterisks. The conflict segments extend from each aircraft's current position to the points along their trajectories at which initial loss of separation is predicted to occur. The non-conflict portion of the route associated with the FDB is displayed in yellow. All other conflict trajectories stop at the asterisk.

5.1.3 Trial Plan Conflict Displays

When trial planning a route, the D2 route is displayed on the Situation Display with trial plan conflict segments highlighted in orange. Asterisks show the points of initial loss of separation. . The portions of the flight plan routes for all aircraft involved in the trial plan conflict are displayed in orange including the asterisks. The conflict segments extend from each aircraft's current position to the points along their trajectories at which initial loss of separation is predicted to occur. The non-conflict portion of the D2 route is displayed in yellow. All other conflict trajectories stop at the asterisk.

5.2 Flight Data Block (FDB)

No changes are being proposed to the DS aircraft track data symbology or color or FDB text array color in support of Direct-To CHI at R-position. The Altitude Menu proposed here is the existing DS altitude pop-up menu design. The FDB will support the interactive 4th line for heading and speed entry. If 4th line data is deleted, any Direct-To data on the line below will move up.

5.2.1 Direct-To Access Symbol in FDB [See figures 10 - 14]

The R-side controller will be able to use the FDB to access the Direct-To Tool. This will allow the R-side controller to access the Direct-To tool for those flights not already on the Direct-To List.

A direct-to symbol ("→") is displayed after the last character of the AID field in the FDB. This symbol serves as a portal into the Direct-To Alternate-Fixes/Altitude View from the FDB. The Direct-To symbol is mustard-colored when there are no Direct-To advisories in the Direct-To View. The Direct-To symbol is emphasized green, yellow, or red to indicate the conflict status of the Direct-To advisory when there is a Direct-To advisory for the flight that displayed in the Direct-To View. When the Direct-To portal symbol is green, it is combined with a green underline to aid in discriminability from the conflict colors.

When the symbol [mustard-colored] is picked (left or right button) the Direct-To Alternate Fixes/Altitudes View is displayed for that flight with the next fix selected and the associated amendment text displayed in the Amendment Area. Conflict data is also displayed in the Amendment Area for flights that present a conflict for the pre-selected fix.

When the symbol [red-colored, yellow-colored, or green-colored] is picked (left or right button) the Direct-To Alternate Fixes/Altitudes View is displayed for that flight with the CTAS recommended direct-to fix selected and the associated amendment text displayed in the Amendment Area. Conflict data and flight data is also displayed in the Amendment Area for flights that present a conflict for the pre-selected fix.

Minutes to flight plan conflict is shown following the Direct-To symbol or fix name. The user can pick the minutes to conflict field to display the conflict graphics.

The user will be able to suppress individually the display of the Direct-To arrow symbol/fix as well as the display of minutes to current plan conflict for all FDBs just as any other fields can be suppressed in an FDB. Suppression and redisplay of the D2 portal symbol will be done via a pick area in the DC View.

5.2.2 Direct-To Coding in Altitude Pop-up menu

When the FDB altitude field is picked and the DS Altitude Pop-up Menu is displayed, the system color-codes the altitudes as red or yellow if there is an alert, or green if no alert was detected. The altitude values are displayed in the DS nominal color of white if not probed. Time to conflict is also displayed in the Altitude Menu after the "T" pick area for interim altitude. When the user selects a value from the altitude pop-up menu the altitude amendment is created and sent to Host. There is no feedback except the altitude change in the datablock.

5.3 Auxiliary Waypoint Capability

The VB step-through demo will provide a capability to simulate the results of this drag and drop action on the Situation Display. (See figures on page 224 of the CTAS Direct-To Reference Manual.)

When waypoint is active, the direct-to heading and fix in line 1 of the FDB is replaced with magnetic/wind corrected heading to demonstrated waypoint and number of minutes before aircraft will reach waypoint at current speed.

A Direct-To trial plan route may be modified on the Situation Display when a fix has been selected for trial planning by creating waypoints. The controller clicks anywhere on the yellow dashed line and a yellow

encircled triangle appears. As the controller drags the triangle, the magnetic/wind corrected heading to demonstrated waypoint and number of minutes to location appears in the FDB in place of the D2 portal and is updated at 1-second intervals. Conflict data is also updated at 1-second intervals and conflict segments will appear when the route is dragged such that it is in conflict with other aircraft. When the user stops the drag and clicks on the location, the Amendment area is populated with amendment text and the user may send the amendment or cancel and create a different waypoint or create a second waypoint by clicking on the D2 route again. Up to two waypoints may be created for one amendment.

6. State Transition Table for Direct-To Presentations

Initial State	Action	Resulting State
Direct-To View displayed	Pick AID/Equip/Dest field (right click) in Direct-To View	Alternate Fixes/Altitudes View displayed replacing Direct-To View. Amendment Area contains Direct-To route data for CTAS recommended fix and any conflict data and AID for conflicting flights if applicable.
Direct-To View displayed	Pick fix/heading (right click)	Alternate Fixes/Altitudes View displayed replacing Direct-To View. Amendment Area contains Direct-To route data for CTAS recommended fix and any conflict data and AID for conflicting flights if applicable.
Direct-To View displayed	Pick FDB symbol for Direct-To (if symbol is mustard indicating no existing entry for the flight in Direct-To View)	Alternate Fixes/Altitudes View displayed replacing Direct-To View. Amendment Area contains Direct-To route data for next fix for the flight associated with the FDB and conflict data and AID for conflicting flights if applicable.
Direct-To View displayed	Pick FDB symbol for Direct-To (if symbol is yellow indicating there is an existing Direct-To advisory entry in the Direct-To View)	Alternate Fixes/Altitudes View displayed replacing Direct-To View. Amendment Area contains Direct-To route data for CTAS recommended fix and any conflict data and AID for conflicting flights if applicable.
Direct-To View displayed	PICK AID/EQUIP/DEST FIELD (LEFT CLICK) IN DIRECT-TO VIEW, RIGHT CLICK ON DELETE	AID/Equip/Dest field is highlighted and remains highlighted until aircraft entry is removed from Direct-To View. Direct-To View remains displayed.

Alternate Fixes/Altitudes View with Amendment Area displayed	Pick fix/heading for flight that is different from what is shown in Amendment Area	Direct-To Alternate Fixes/Altitudes View displayed with Amendment Area containing data associated with newly selected fix/heading.
Alternate Fixes/Altitudes View with Amendment Area displayed	Pick FDB symbol for Direct-To (symbol is mustard indicating there is no existing Direct-To advisory entry for the flight in the Direct-To View)	Direct-To Alternate Fixes/Altitudes View with Amendment Area displayed. Amendment Area contains Direct-To route data for next fix for the flight associated with the FDB and conflict data for conflicting flights if applicable.
Alternate Fixes/Altitudes View with Amendment Area displayed	Pick FDB symbol for Direct-To (symbol is yellow indicating there is an existing Direct-To advisory entry in the Direct-To View)	Direct-To Alternate Fixes/Altitudes View with Amendment Area displayed. Amendment Area contains Direct-To route data for CTAS recommended fix for the flight associated with the FDB and conflict data for conflicting flights if applicable.
Direct-To Alternate Fixes/Altitudes View displayed	Pick RETURN button	Direct-To View displayed.
Direct-To Alternate Fixes/Altitudes View displayed with no Amendment Area	Pick fix/heading	Alternate Fixes/Altitudes View displayed. Amendment Area contains Direct-To route data for controller-selected fix displayed in fix/heading column and any conflict data for the closest conflicting flight if applicable.
Direct-To Alternate Fixes/Altitudes View displayed with no Amendment Area	Pick altitude value	Alternate Fixes/Altitudes View displayed. Amendment Area contains altitude amendment for controller-selected altitude and conflict data for any conflicting flights.
Direct-To Alternate Fixes/Altitudes View displayed with altitude amendment in Amendment Area.	Pick AMEND button in Amendment Area.	Amendment Area status field displays AM SENT TO HOST until response is received, then Host response is displayed in status field, HOST ACCEPT AM and Amendment Area is removed after adapted time. The Alternate Fixes/Altitudes View remains. If the response is a REJECT, the user may either pick Close FP, or make another trial planning selection, or return to the D2 View.

Direct-To Alternate Fixes/Altitudes View displayed with route amendment in Amendment Area	Pick AMEND button in Amendment Area.	Amendment Area status field displays AM SENT TO HOST until response is received, then Host response is displayed in status field, HOST ACCEPT AM and Amendment Area is removed after adapted time and the view returns to the Direct-To View. If the response is a REJECT, the user may either pick Close FP, or make another trial planning selection, or return to the D2 View.
Flight Data Block	Pick altitude field	Popup altitude menu with flight levels coded for conflict status.
Flight Data Block	Pick conflict numeral	Flight plan conflict segments displayed.
Flight Data Block	Pick conflict numeral again	Toggle off conflict segment display.
Trial plan route displayed on Situation Display	Pick on D2 route and drag cursor at yellow triangle.	FDB updated with waypoint information (heading and minutes) at 1-second intervals. Amendment Area route and conflict info updated at 1-second intervals.
Trial plan route yellow triangle drag stopped with one waypoint showing in amendment text.	Click on waypoint1 triangle symbol	FDB updated with waypoint information (heading and minutes) at 1-second intervals. Amendment Area route and conflict info updated at 1-second intervals. Amendment text contains 1 waypoint.
Trial plan route displayed on Situation Display with one waypoint already in amendment text.	Pick on D2 route on different location, and drag cursor at yellow triangle	FDB updated with waypoint information (heading and minutes) at 1-second intervals. Amendment Area route and conflict info updated at 1-second intervals with info on 2nd waypoint.
Trial plan route yellow drag stopped with two waypoints showing in amendment text.	Click on waypoint2 symbol	FDB updated with waypoint information (heading and minutes) at 1-second intervals. Amendment Area route and conflict info updated at 1-second intervals. Amendment text contains 2 waypoints. No further pick of D2 route possible after click until amendment sent or canceled.
Popup altitude menu in FDB	Pick on altitude	Popup altitude menu removed; amendment sent to Host, no status displayed. If Host accepts, FDB altitude field is updated with amended value.
Conflicts View displayed	Pick anywhere on conflict pair entry.	Red conflict graphics displayed for both aircraft on the Situation Display.

7. Visual Basic Step-Through Demo – Summary

- Direct-To View
- Alternate Fixes/Altitudes View
- Waypoints
- Trial plan conflict segments
- Flight plan conflict segments
- Conflicts View and conflict graphics

8. VB Slide Demo Exceptions

1. A-lines are covered in DS adaptation and will not be reflected in the VB demo.
2. Flight Plan Trajectory lines (white) will not be displayed. Host flight plan route lines will be displayed along with the Direct-To route line. Since the flight plan trajectory line largely overlaps the green Host route lines in CTAS, it was agreed to eliminate the CTAS trajectory lines. Controllers have an interest only in how the Direct-To route compares to the Host route.

Appendix A : COREL DRAW PICTURES

See next page.

CTAS DIRECT-TO TOOL (DS R-POSITION CHI)

Direct-To View displays ACID/EQUIP/DEST, Direct-to fix and heading, minutes saved with direct-to route, and conflict status for direct-to route, in that order.

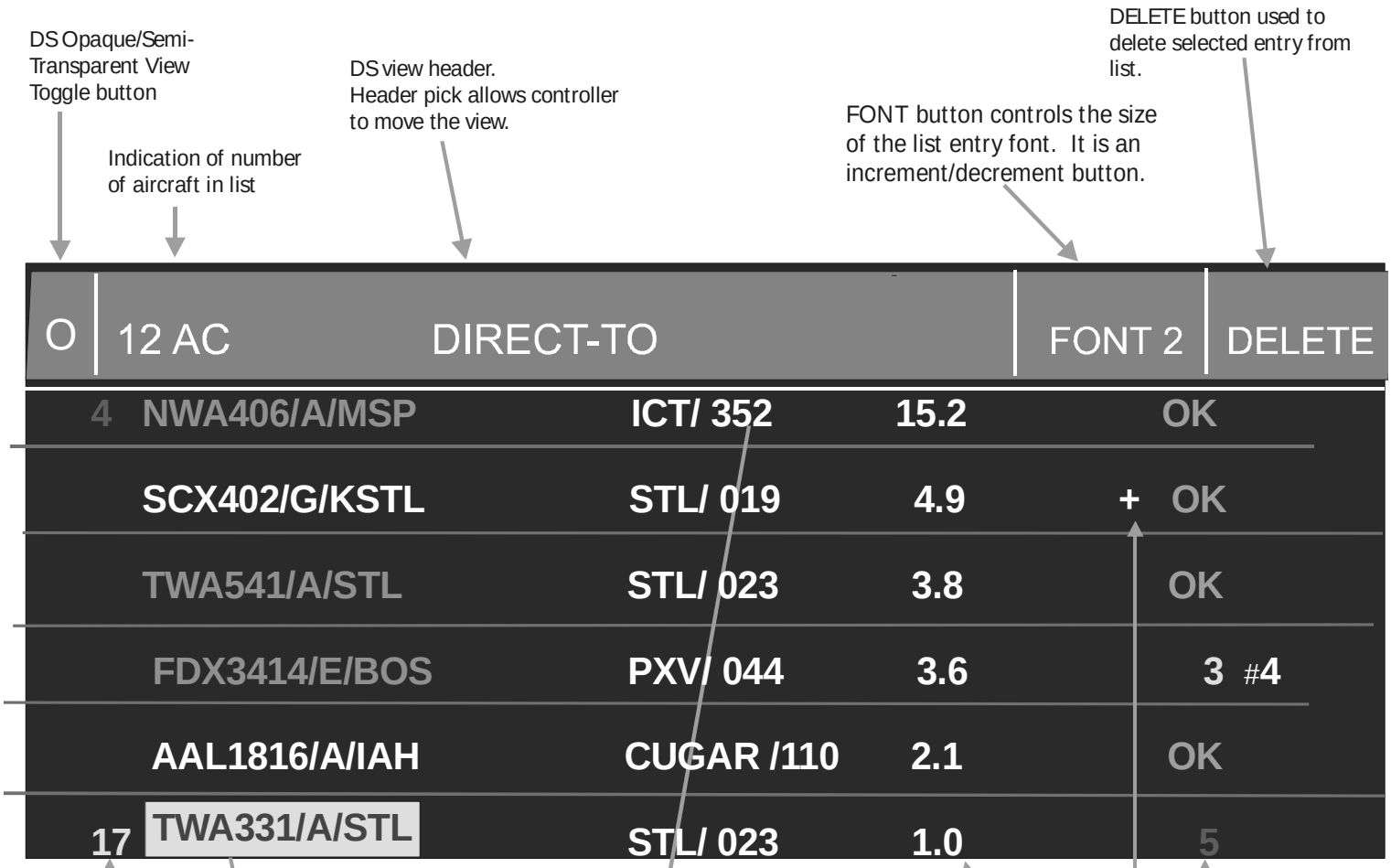

Figure 1 - Example of Direct-To List

Red/yellow number (time to conflict) indicates aircraft's current route of flight is in conflict.

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Fix/heading data for an entry is picked to initiate trial planning.

Conflict Status for Direct-To route: OK = clear; digits = conflict exists. Alerts shown in red/yellow. If more than one exists a " # d " is displayed.

Picking the acid/equip/dest field with the left DS trackball button/left mouse button) allows the controller to select the flight for further action. For example, controller picks the flight and then picks the DELETE button to delete the entry.

Indicates aircraft on Host Preferential Route.

Picking the acid/equip/dest field with the middle DS trackball button/right mouse button initiates trial planning and results in the display of the flight plan route and the direct-to route on the DS R-position Situation Display, as well as display of alternate fixes, altitudes, and amendment text for the direct-to route. Reverse video indicates the flight that is being worked currently.

The MIN SAVED column indicates the number of minutes the Direct-To fix reduces the flight time of the route.

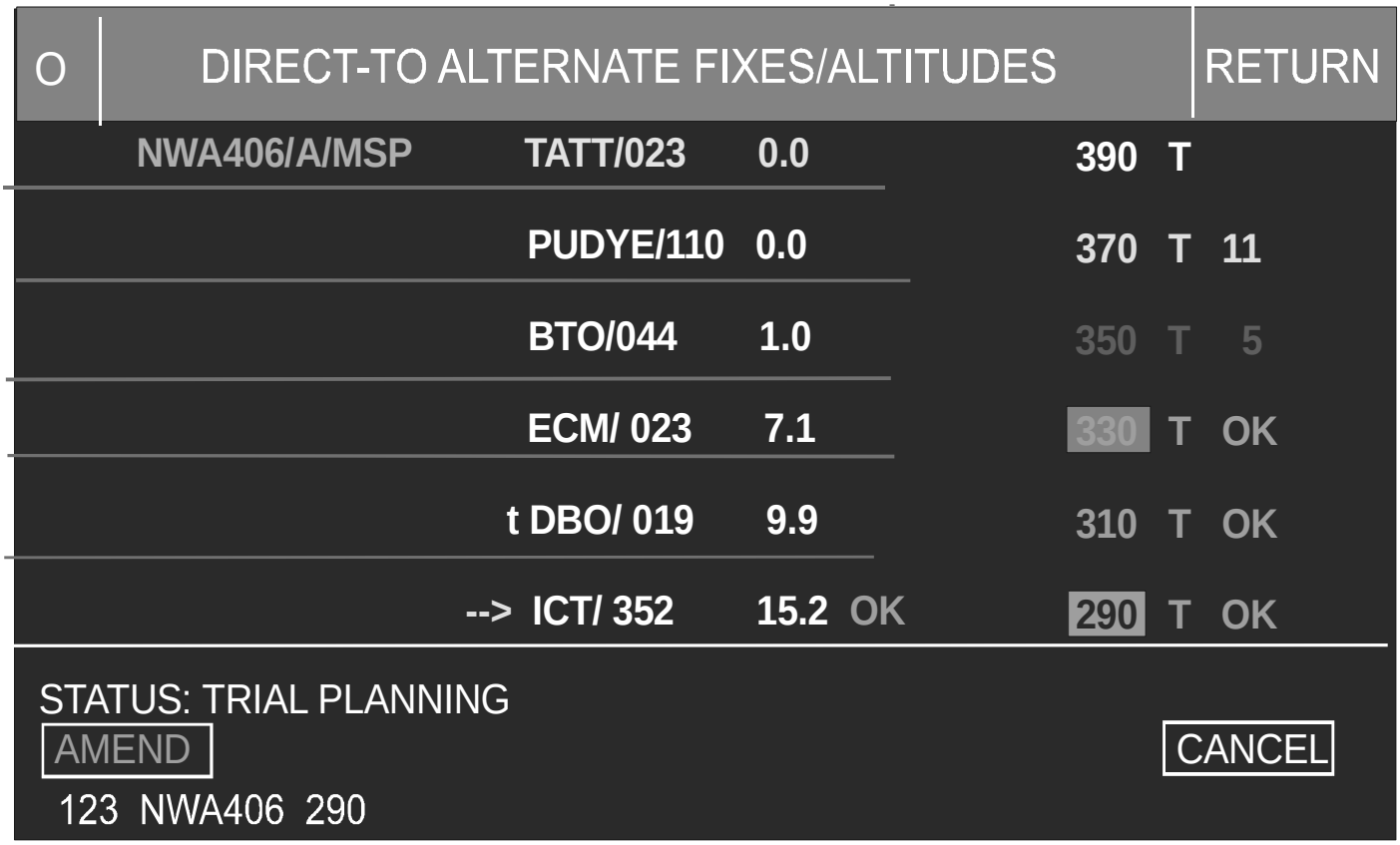


Figure 2- Example of Direct To Alternate Fixes/Altitude View

Data within the Alternate Fixes/Altitudes View is similar to the data in the primary Direct-To View except that alternate fixes and associated time savings for a single aircraft is displayed. The fixes are displayed according to distance of fix from current position along the flight plan route with the next closest fix at the top. Altitudes for the selected fix are displayed when clicking on the ALT button.

When an alternate fix is selected, the software probes the new trial plan direct-to route and altitudes for potential conflicts and displays the results in the Amendment Area

The CTAS selected fix is indicated by green OK or red/yellow numeric suffix and the direct-to arrow .

Fix/heading field may be prefixed either with a "t" to indicate that the CTAS selected direct-to route contains a transition fix or that an alternate route contains a transition fix.

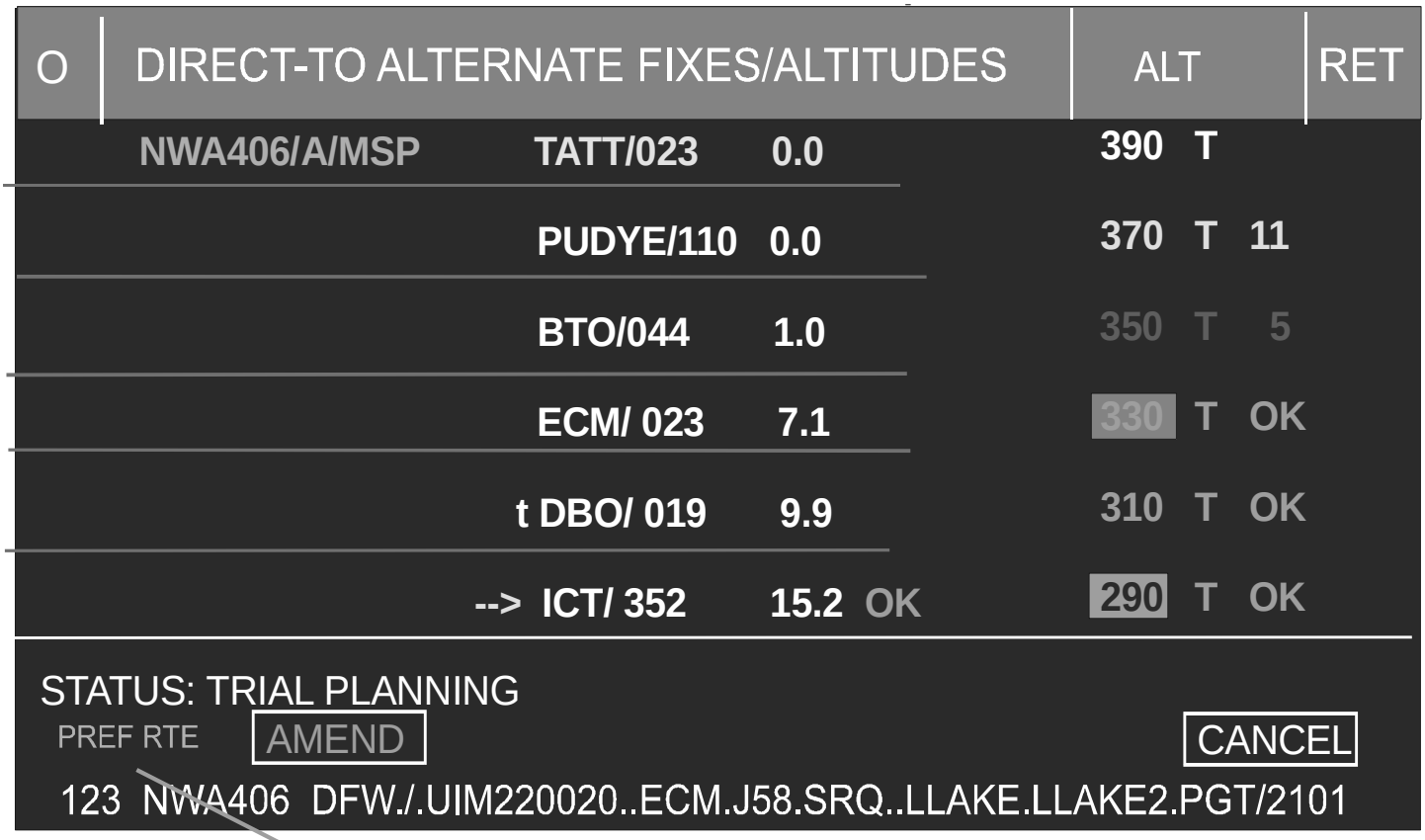


Figure 3- Direct To Alternate Fixes/Altitudes List with a fix selected for trial planning

Amendment Area for displaying Host Amendment Text and buttons for sending the amendment to Host (AMEND) and for canceling the amendment (CANCEL). The Amendment Area is only displayed when one of the flights has been selected, else this area is not displayed and the view is contracted in size. The Amendment Area only displays the acid and the direct-to route text (50 characters per line, 2.5 lines, for a total of 125 characters).

When the amendment is canceled, the Amendment Area is removed.

When the controller picks the AMEND button to send the Amendment to Host, the AMEND button will be gray shaded and remain gray shaded until a Host response to the amendment is received.

If the selected CTAS D2 route will trigger Host Pref. Route processing, the label "PREF RTE" is displayed before the AMEND button.

Upon Host acceptance the Amendment Area is removed after a period of time. Upon Host rejection a REJECT indicator will be displayed in the Amendment Area and the user can select CANCEL to remove the Amendment Area.

Status is on a separate line above the AMEND and CANCEL buttons. Host error messages can be up to 150 characters.

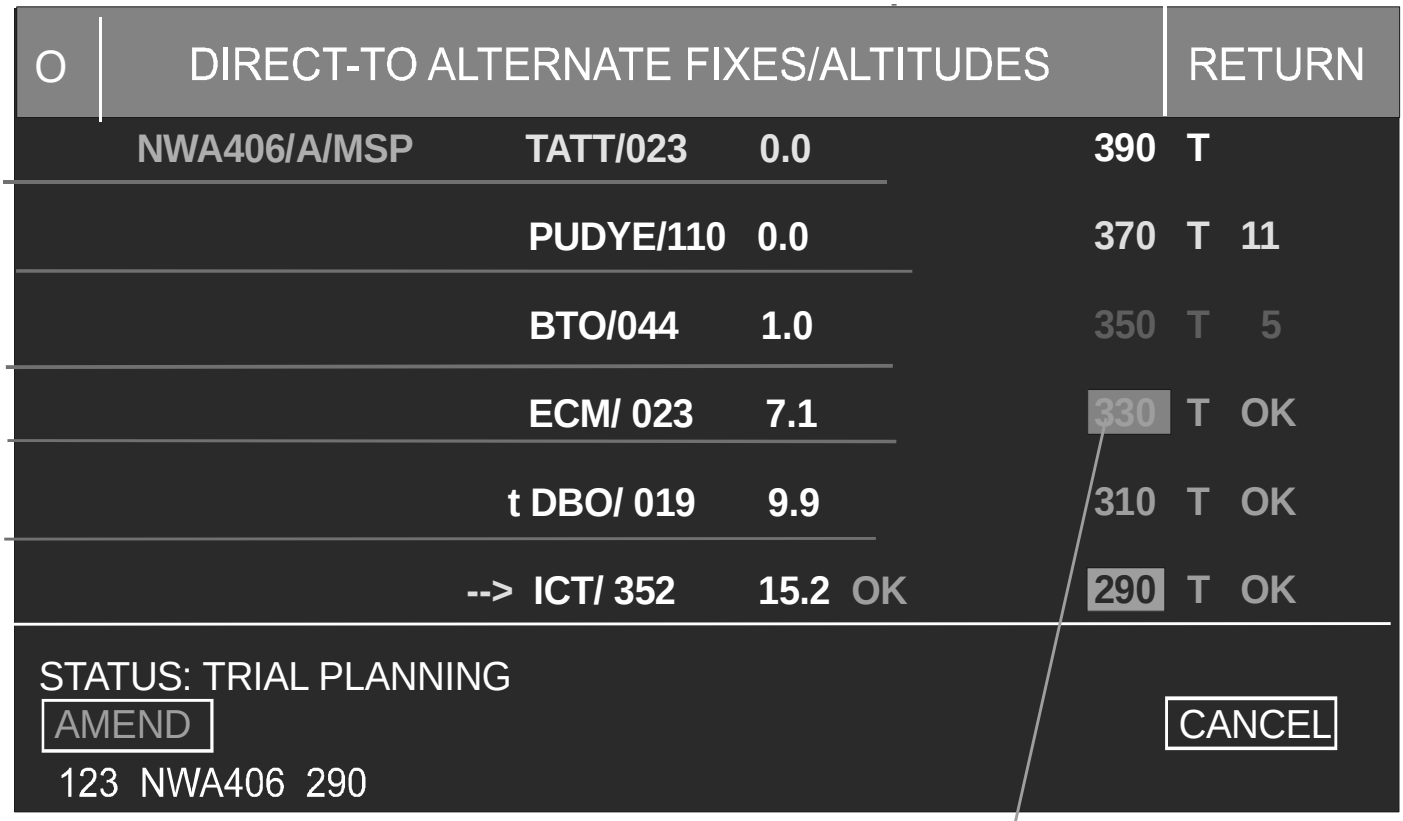


Figure 4- Example of Direct To Alternate Fixes/Altitude View

For aircraft in level flight, probes are run for the two flight levels above and the two flight levels below the assigned or selected altitude. For aircraft that are either climbing or descending, probes are run for all flight levels between the current altitude and the altitude to which it is cleared, up to a max of 11 levels

Results of the probe are indicated by the color of the altitude value. Red and yellow indicate a projected conflict. The value after the altitude is the number of minutes until the loss of separation. Green indicates no conflict. White values were not probed

.

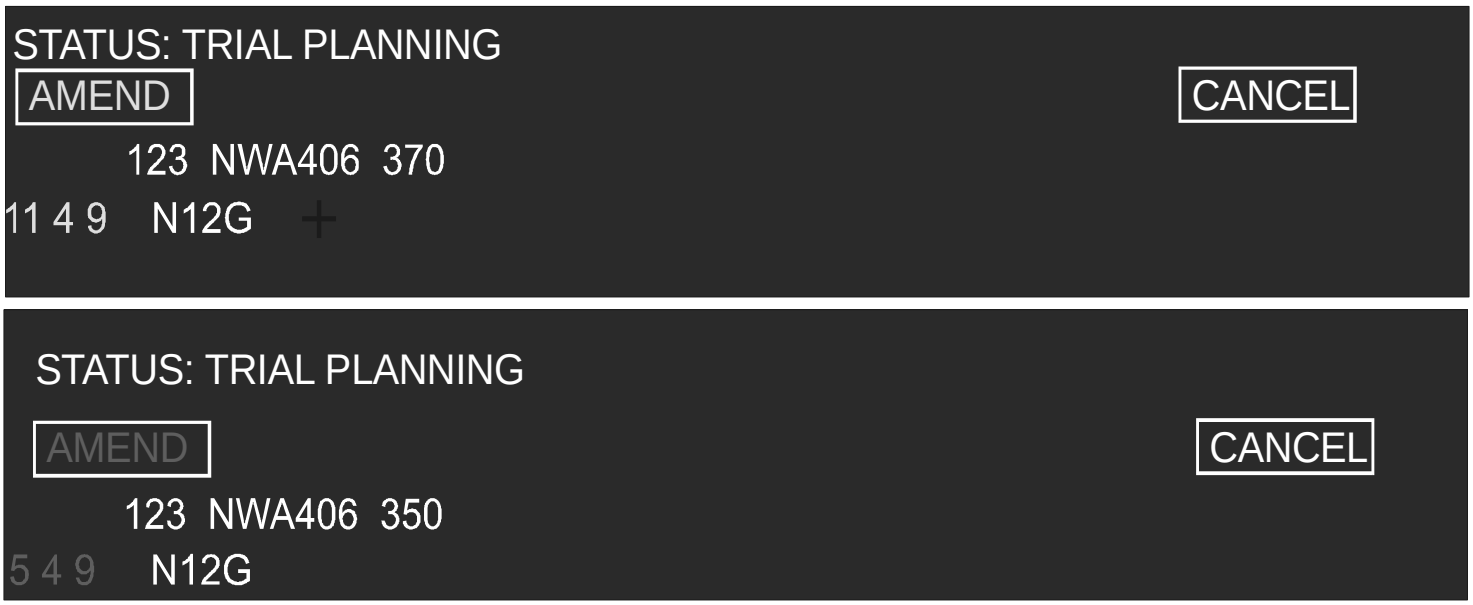


Figure 5 – Amendment Area with yellow or red-coded conflicting flights

CTAS DIRECT-TO TOOL (DSR-POSITION CHI)

A green color-coded AMEND button in the Amendment Area indicates that the Direct-To route is conflict free. A red or yellow color- coded AMEND button indicates that the Direct-To route is in conflict.

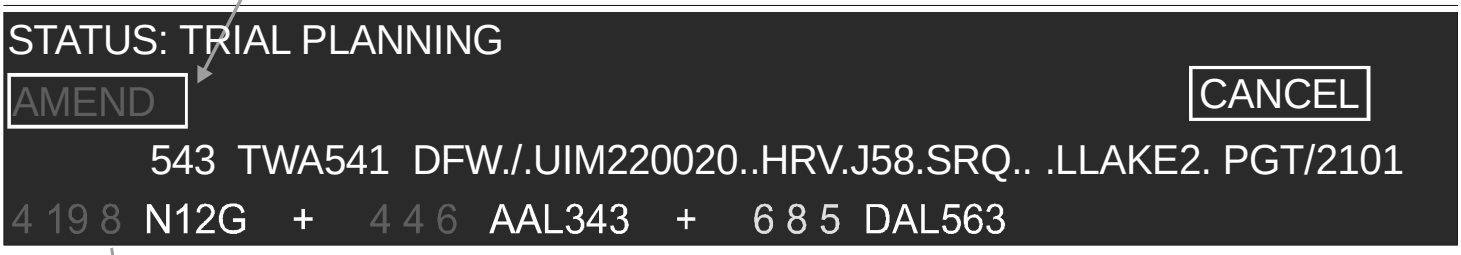


Figure 6 - Example of Direct-To Amendment Area and Direct-To Route in Conflict with 3 aircraft

Conflict data for Direct-To route

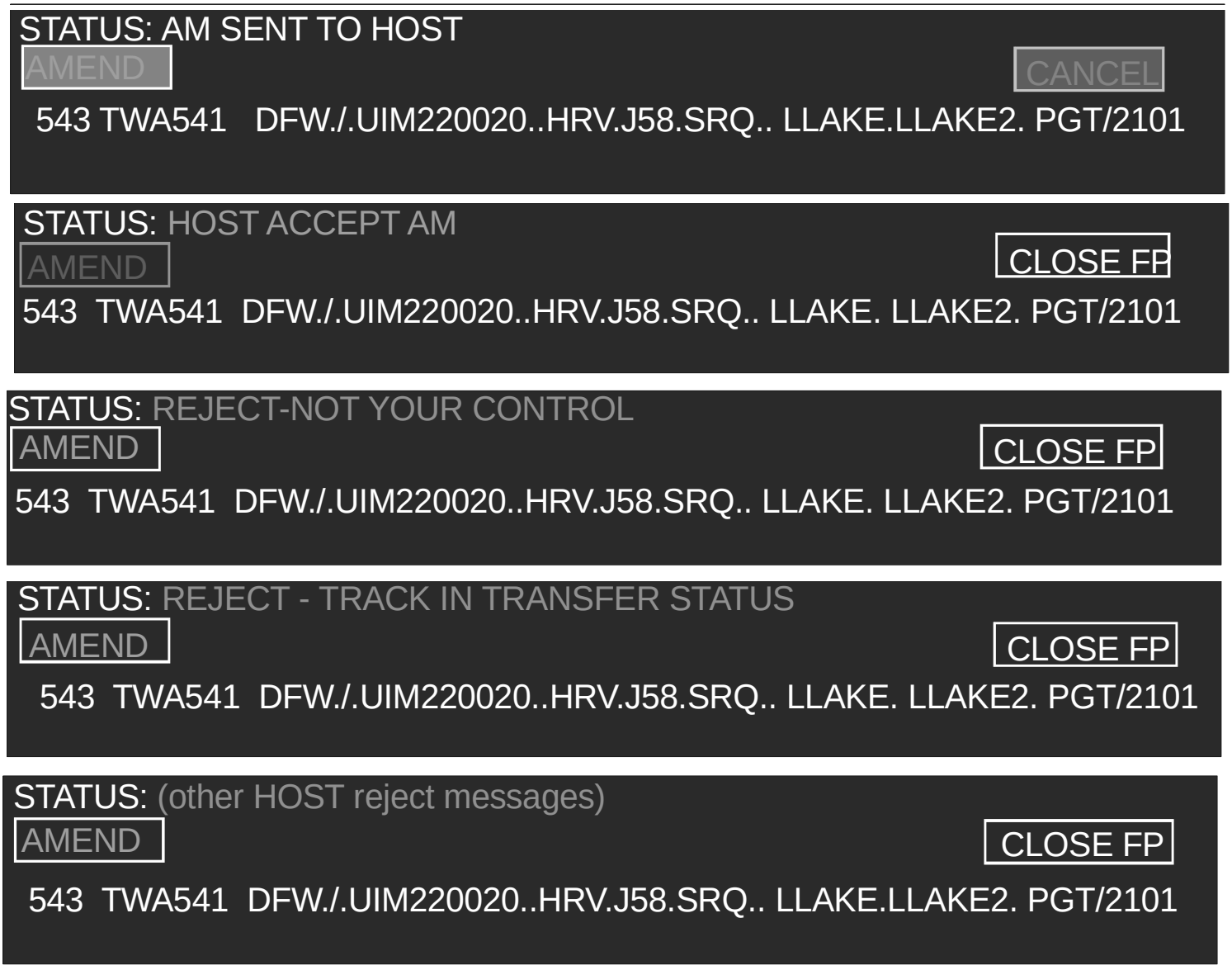


Figure 7- Example of STATUS messages in Amendment Area

CTAS DIRECT-TO TOOL (DSR-POSITION CHI)

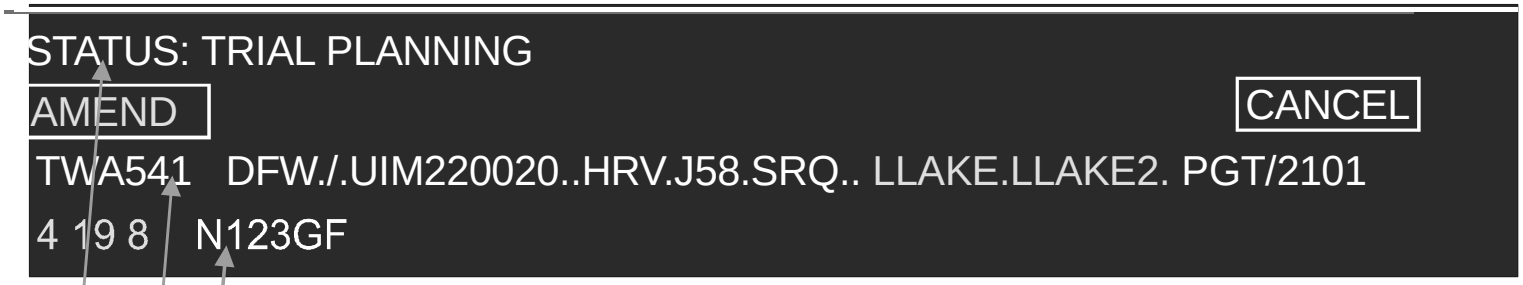


Figure 8 - Amendment Area Character Counts

50 character line displaying status with up to 41 characters of Host error/reject message text. If more than 41 characters of error message text, an asterisk will be placed in the 41st position to indicate there is more error mssage text than can be displayed (open issue: need to decide whether the user can click on the asterisk (Box/asterisk) to see the entire message. This would expand the view.)

Up to 2.5 lines at 50 characters per line for a total of 125 characters

Up to 50 characters of conflict data and AIDs.

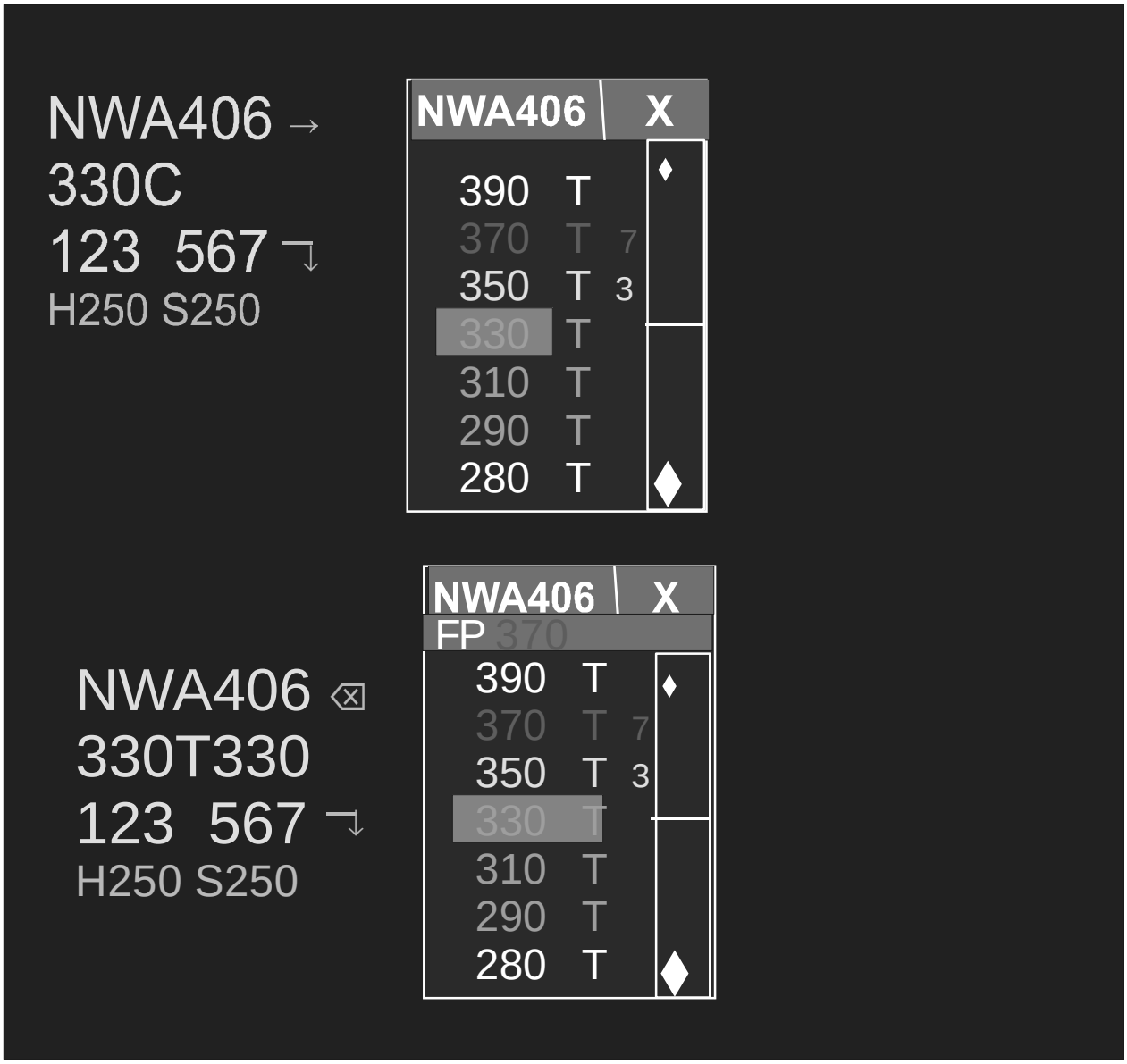


Figure 9 - FDB Altitude Pop-Up Menu
with two altitudes above and below probed
for conflicts. Time to conflict is also displayed.
Controller selects altitude to
amend flight plan altitude. Upon altitude
selection the menu is closed.

DS FDB with D2 symbol after ACID. This symbol is the portal into the D2 View for the flight.

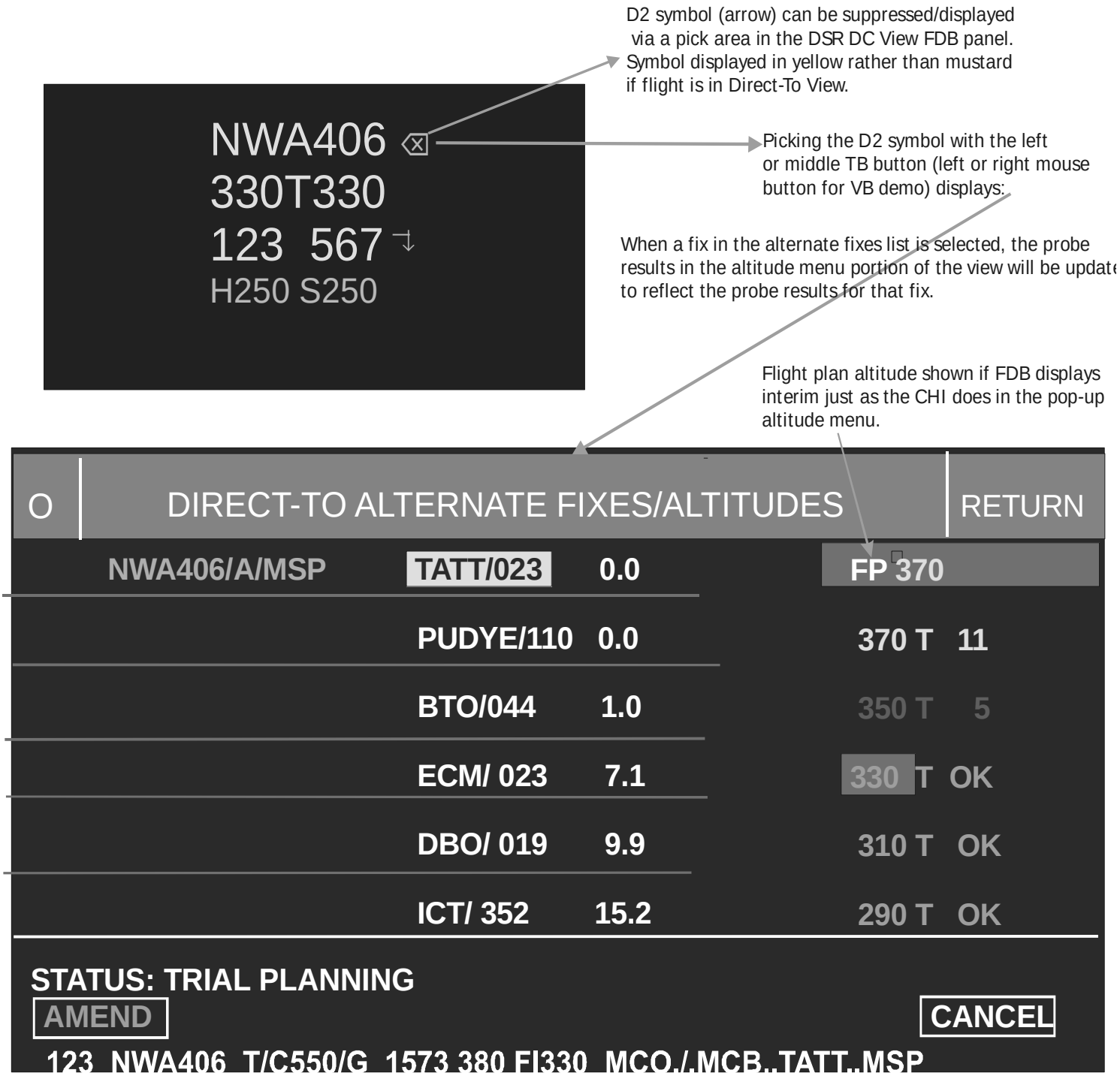
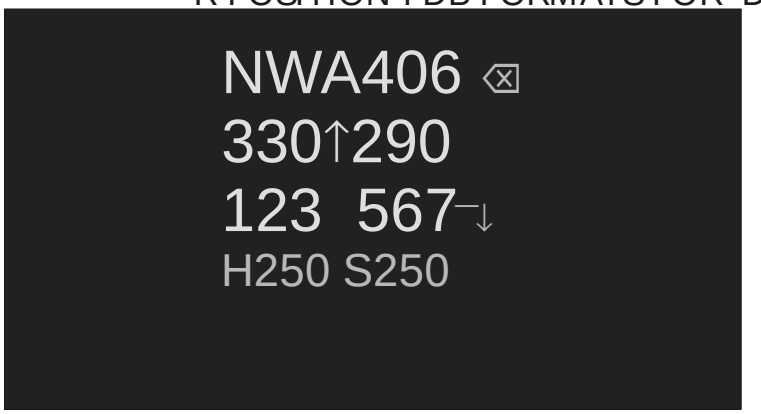


Figure 10 - When the D2 symbol in the FDB is selected, the DS Direct-To Alternate/Fixes/Altitude View for that flight is displayed with the next fix selected and displayed in the Amendment Area.

R-POSITION FDB FORMATS FOR D2 (without CPDLC)

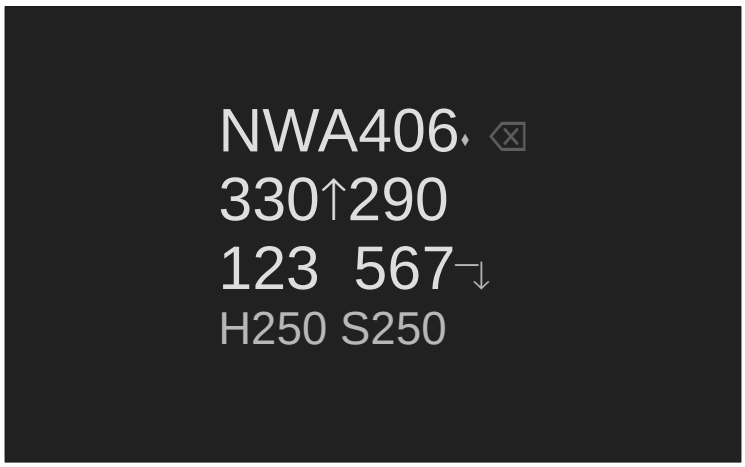


FDB with D2 symbol for flight not in D2 View.

FDB with D2 symbol for flight that is in D2 View.

R-POSITION FDB FORMATS FOR D2 (with CPDLC)

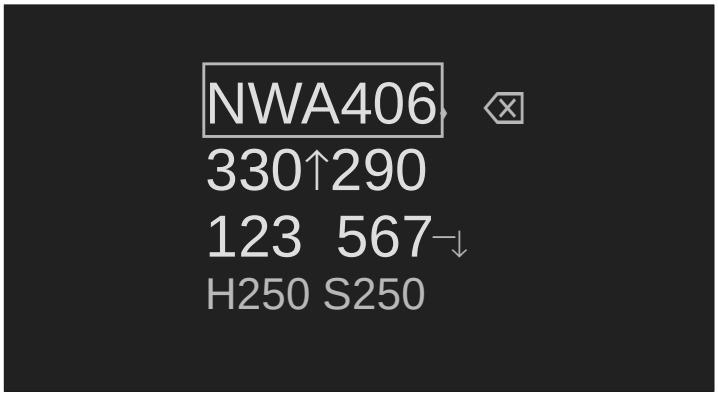
FDB with D2 symbol for flight not in D2 View.



FDB with D2 symbol for flight that is in D2 View.

FIGURE 11 FDB FORMATS

R-POSITION FDB FORMATS FOR D2 (with CPDLC)



FDB with D2 symbol, CPDLC symbol ♦ and uplink coding (box around acid)

FDB with D2 symbol, CPDLC symbol for pilot downlink (green arrow)

FDB with D2 symbol, CPDLC eligibility symbol ♦ ,or CPDLC downlink symbol I↓, and uplink coding (box around acid) and CPDLC text and Status on line 0

FIGURE 12 FDB FORMATS

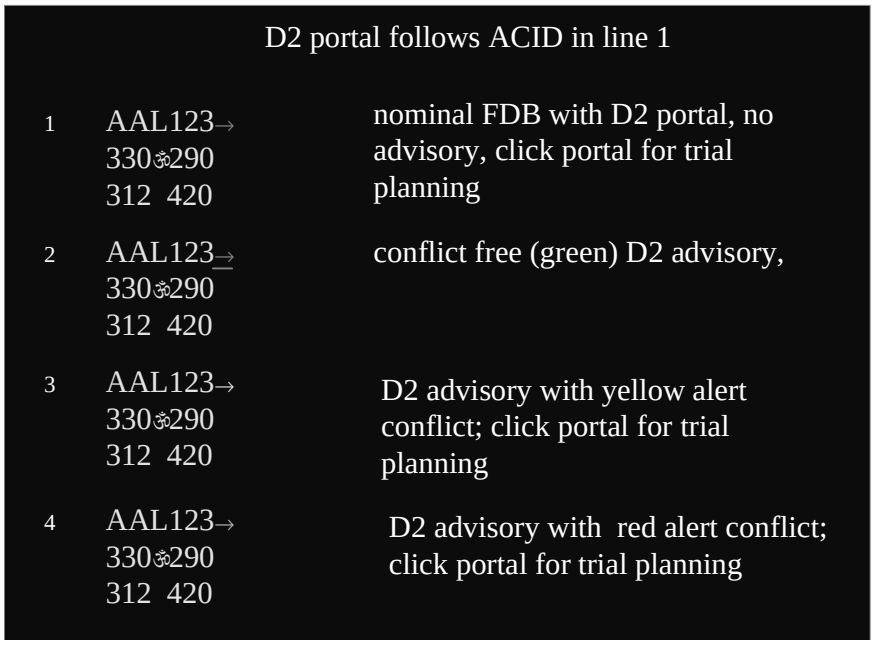


Figure 13-Direct-To Portal Symbol and Conflict Time for FDB

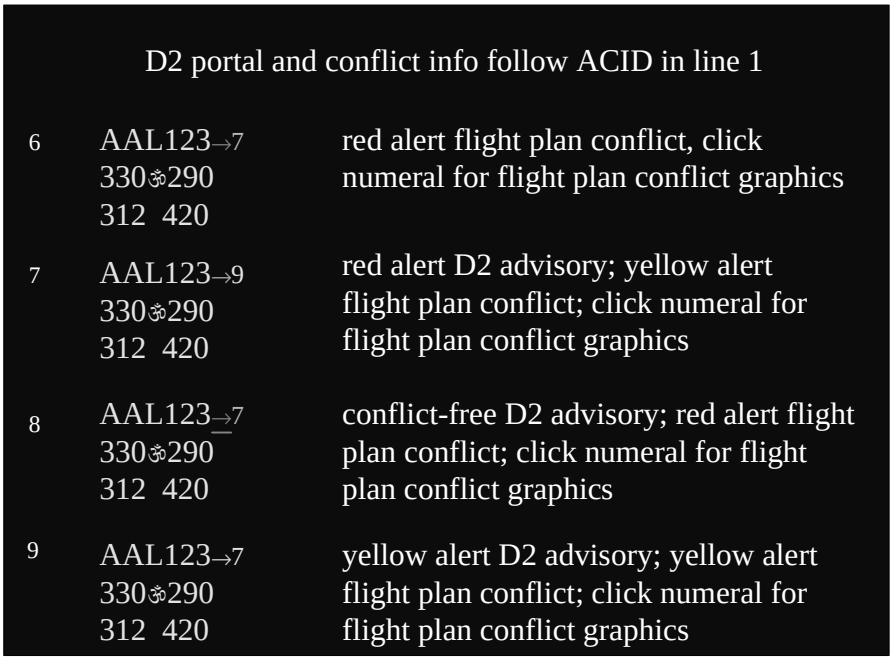


Figure 14- Direct-To Portal Symbol and Conflict Time in FDB

DIRECT-TO CONFLICTS VIEW (DS R-POSITION CHI)

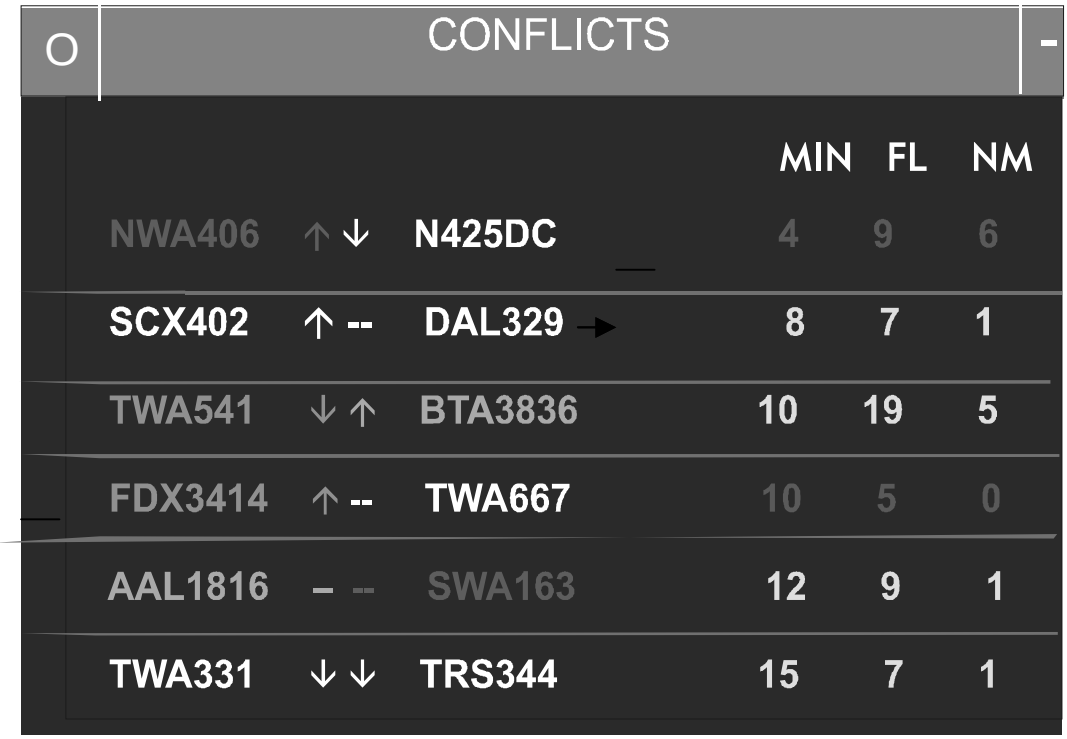


Figure 15 - Example of Conflicts View.

Aircraft ID controlled by the sector position are color-coded for departure (blue), overflight (white), or arrival (green).

Aircraft not controlled by the sector position are gray in color.

Picking anywhere on an entry line brings up the conflict graphics for the pair of aircraft.

DIRECT-TO AUXILIARY WAYPOINTS (DS R-POSITION CHI)

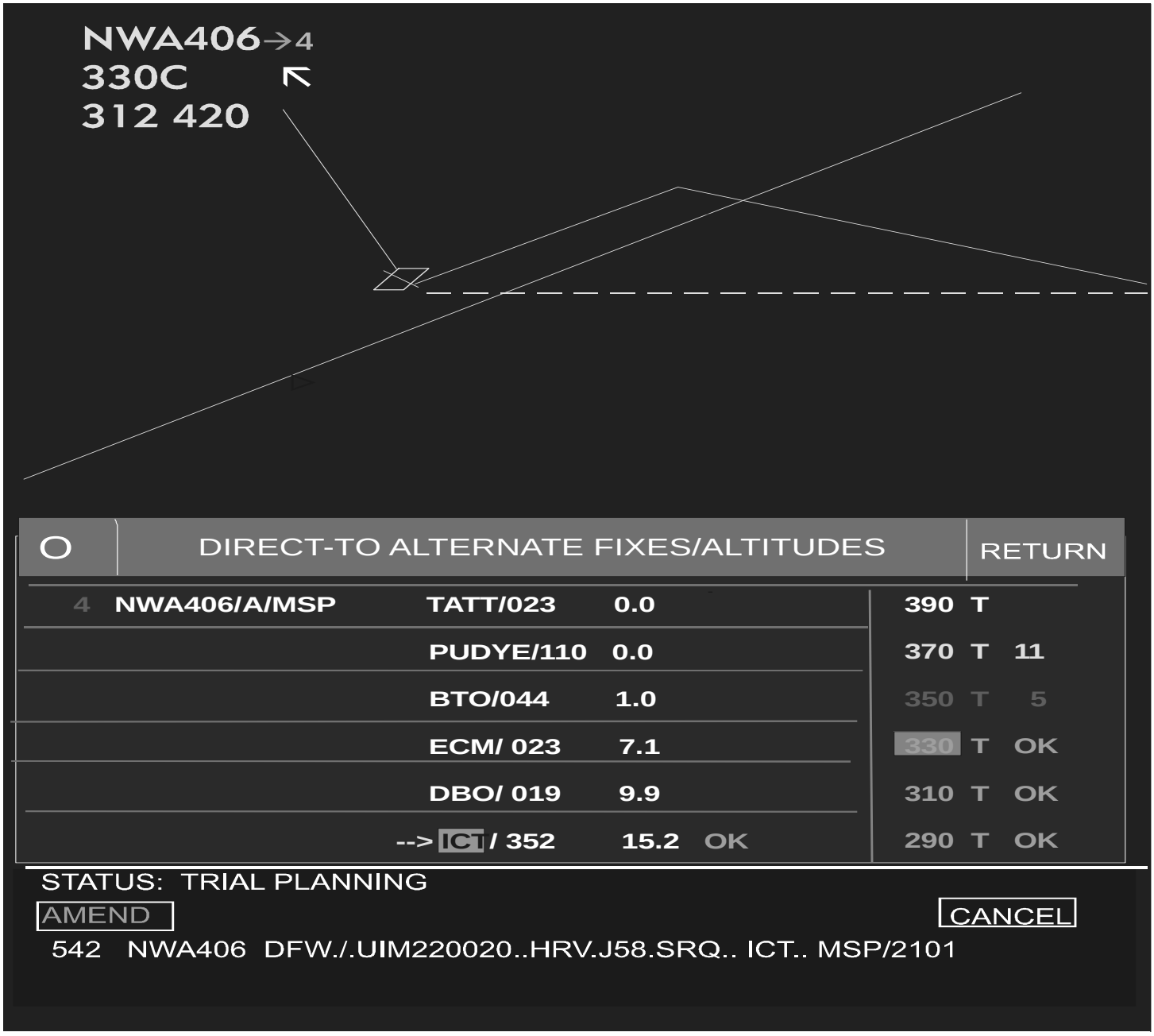
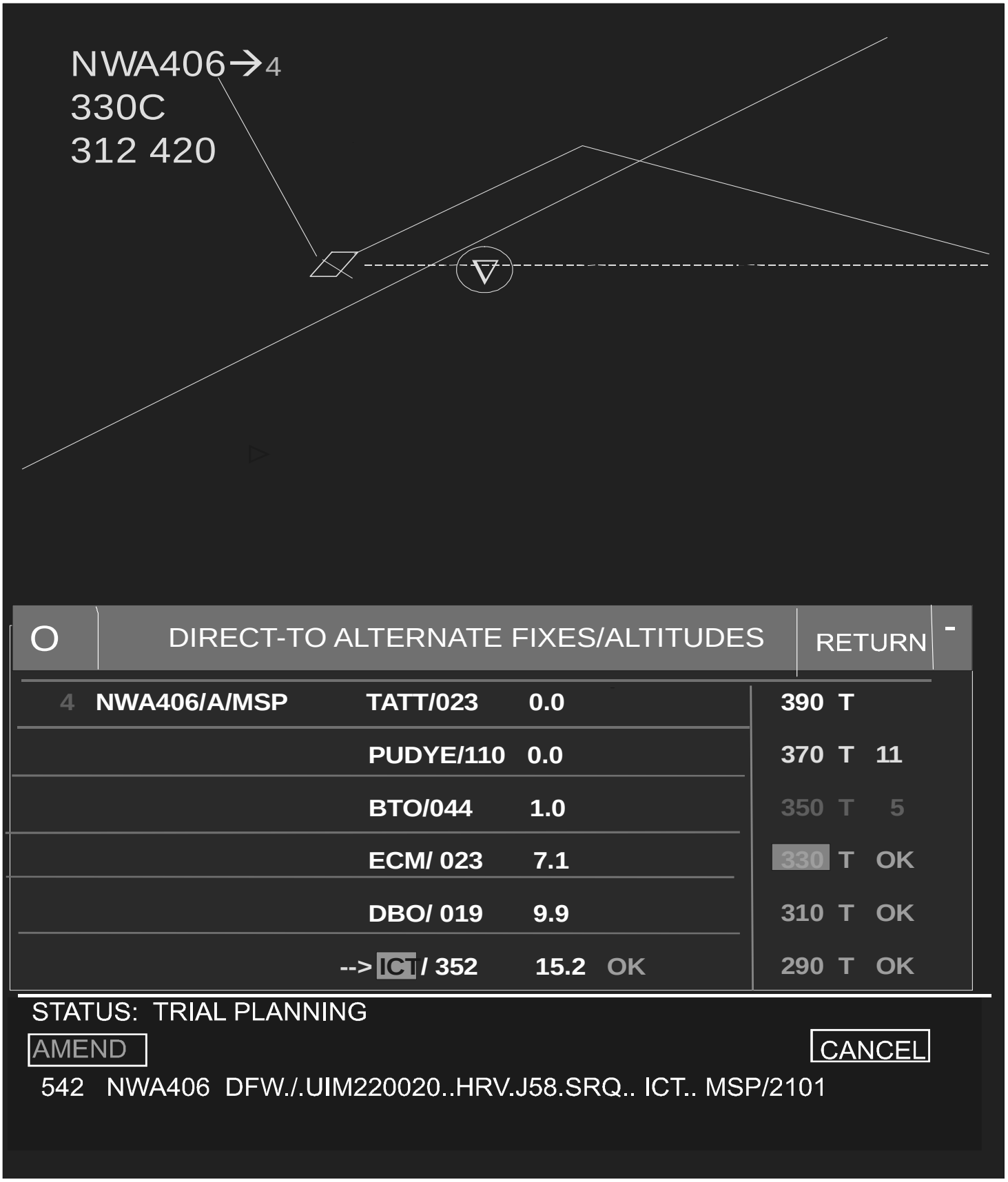


Figure 16. Picking the portal to bring up the Alternate Fixes/Altitudes View and D2 trial plan route.

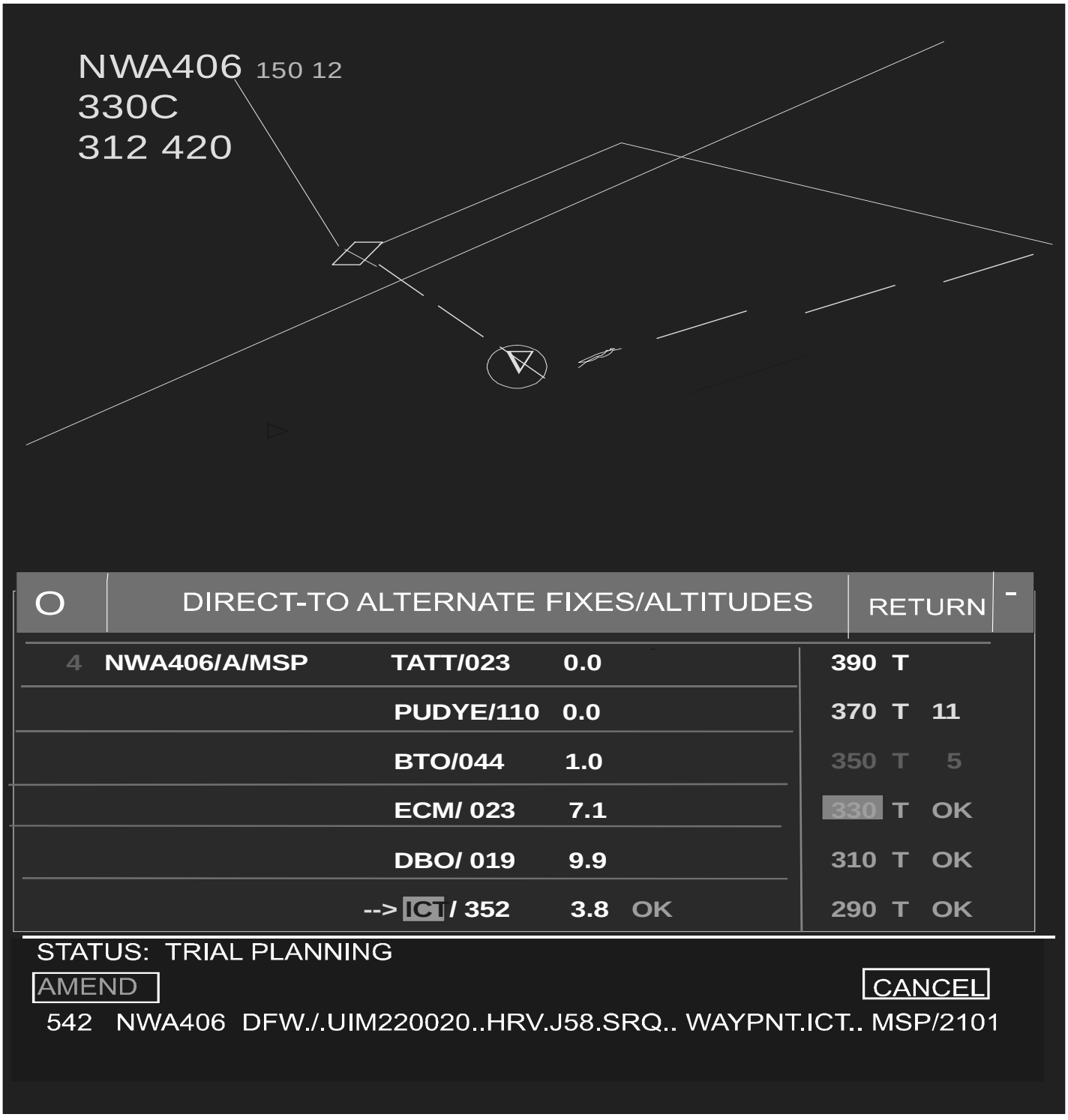
DIRECT-TO AUXILIARY WAYPOINTS (R-Position)

Figure 17. Picking the D2 route



DIRECT-TO AUXILIARY WAYPOINTS (DS R-POSITION CHI)

Figure 18. Dragging the D2 route



Trial Plan Conflict Lines

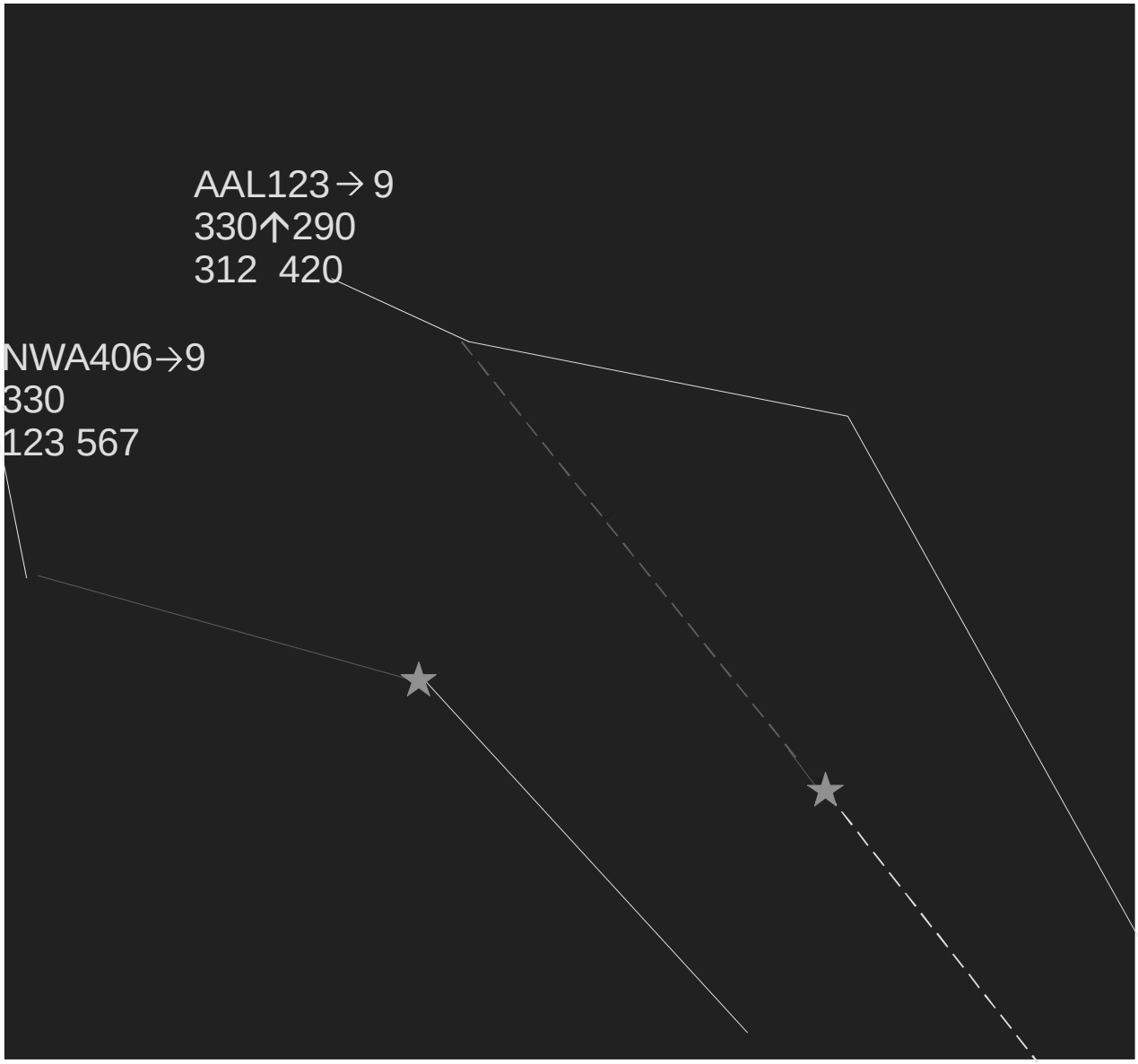


Figure 19. Trial plan conflict routes displayed during trial planing.

The trial plan route of AAL123 is in conflict with another aircraft. Orange coding shown from current position to initial loss of separation.